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CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 23 December 2003 with an application for Letters Patent number 530388 made by TREVOR DOUGLAS ANTHONY SCHWASS.

Dated 11 January 2005.

Neville Harris
Commissioner of Patents, Trade Marks and Designs

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530388

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PATENTS ACT 1953

PROVISIONAL SPECIFICATION

MATERIAL DISCHARGE CONTROL APPARATUS

I, TREVOR DOUGLAS ANTHONY SCHWASS, a New Zealand citizen, of 3 Nilgiri Road, Poraiti, Napier, New Zealand, do hereby declare this invention to be described in the following statement:

This invention relates to hoppers and discharge rate control systems for use therein. More particularly, but not exclusively, the present invention relates to an apparatus for controlling the discharge flow rate of material from a hopper.

Conventional hoppers discharging granular or particulate material directly through a discharge outlet by gravity feeding the material experience a variety of disadvantages. One problem is the amount of dust released into the surrounding environment can be undesirable. Further, the discharge flow rate can not be controlled and this can be useful in some applications.

It is a non-limiting object of the invention to provide a discharge valve for controlling the discharge of free flowing material in a conveying means that overcomes at least some of the abovementioned problems, or at least to provide the public with a useful choice.

According to a broad aspect of the invention there is provided a discharge valve apparatus for controlling the flow rate of material passing through an outlet of a conveying means, the apparatus including a substantially vertically aligned valve means configured and arranged adjacent the discharge outlet and being associated with a control means, the control means being adapted to be associated with a said conveying means, the valve means and the conveying means being adapted to move relative to the other, in use, to control the rate of discharge of free flowing material through the outlet.

Preferably the valve means includes a conical end portion.

Advantageously the control means includes a hopper height adjustment means.

Additionally the invention further includes a conveying means.

The invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1: Shows a side view of the discharge valve apparatus according to one embodiment of the invention; and

Figure 2: Shows an end view of the discharge valve apparatus of figure 1.

Referring to the figures, a discharge valve apparatus, generally referred to as 1, according to a preferred embodiment of the invention, is illustrated.

The discharge valve apparatus 1 is configured and arranged in association with a conveying means 2, in the form of a hopper and the like, for controlling the flow rate of material passing through an outlet of a conveying means 2. In this embodiment of the invention, and for ease of reference, references to a hopper 2 will be used as a non-limiting example of a conveying means.

Controlling the rate of discharge in a hopper 2 as in the present invention is desirable as it can result in reducing the discharge of dust into the areas about the hopper 2 during the conveying process.

The hopper 2 is represented in this embodiment as having a side wall 3 that is substantially vertical in form. The side wall 3 is circular to define an opening 4 into which suitable material is placed for conveying through the hopper discharge outlet 5. Suitable material may include particulate or granular material (not shown). A conical portion 6 to direct material to be conveyed toward the outlet 5 may be provided. The conical portion 6 extends from the circular side wall 3 to the lower end of the conical portion to define a circular discharge outlet 5. It will be appreciated that if the bulk solid material being conveyed is a granular material, it can be dropped into the opening of the hopper 2 and is gravity fed toward the discharge outlet 5.

The discharge valve apparatus 1 advantageously includes a valve means 7 configured and arranged adjacent the discharge outlet 5. The valve means 7 is preferably substantially vertically aligned and is elongate. The lower end portion of the valve means 7 is desirably provided with a conical end portion 8. The conical end portion 8 is desirably provided with an outer surface having an angle that is substantially parallel with the conical portion 6 of the hopper 2. Advantageously the middle portion of the valve means 7 can be tapered towards the top end portion 9 of the valve means 7. This may increase the stability of the valve means 7 during the conveying process.

The top end portion 9 of the valve means 7 is associated with the control means, and in this embodiment the top end portion includes a cap 9 being provided with anchor points for allowing a rope or chain means 10 to be attached thereto. In this embodiment a metal chain is provided as it has no elastic properties. The chains 10 extend from the cap 9 to be attachable about a pipe 11 by any known attachment means such as a clamp or a shackle. It is envisaged that the invention may include a means to adjust the chains 10 to thus adjust or set the distance between the valve means 7 and the hopper 2 if required. This adjustable feature may be useful to allow a secondary means for setting the gap between the valve means 7, and the conical portion 6 of the hopper 2 and outlet 5. This gap may be predetermined before conveying begins and may be about 20 to 25 millimetres or as required depending on the material being conveyed and the desired rate of flow of the material through the conveying means. It will be appreciated that different gaps will be required for different types of granular or particular material being conveyed.

In this non-limiting embodiment the hopper 2 is adapted to be movable in a vertical plane by a desirable suspension and support arrangement. The arrangement includes four brackets 12 attached to the mouth of the opening 4 of the hopper 2 in a spaced apart arrangement desirably equidistant from each other. Each bracket 12 is adapted to attach to the lower end of vertically extending hopper support members 13. The top end of each hopper support member 13 is attached to the pipes 11 by a mounting means preferably in the form of a clamp 14. The clamp 14 may preferably include hopper support member adjusting means in the form of adjustable screws and wherein the top end of the support members 13 may be threaded to allow for the distance between the pipes 11 and the mouth or opening 4 of the hopper 2 to be adjusted and set, as required.

The pipes 11 are mounted at each end thereof to spaced apart beams 15. The beams 15 are fixed in a horizontal plane at a suitable height from the hopper 2 and serve and provide an anchor to the hopper support arrangement.

Each hopper support member 13 is flexible in form such that it can stretch or expand under a weight of lading such that the hopper 2 lowers relative to the pipes 11 and beams 15 when material is conveyed into the hopper 2 and rises relative to the beams 15

as material exits the outlet 5. Any desirable material or component that can expand under a load or weight of lading can be used such as, for example, a spring. It is envisaged that different types of hopper support members 13 can be provided depending on the material being conveyed through the hopper 2.

A desirable result of this invention is with causing a solid column of conveyed material to flow from the outlet 5 with a lower dust level than a standard hopper without a valve means.

It is seen that the weight of lading or the head of material being conveyed through the hopper 2 can squeeze air trapped in the material to allow the material to flow as a solid column from the outlet 5.

The invention may comprise the features of the first broad aspect to allow a conveying means to be retrofitted, or the invention may include the first broad aspect of the invention being configured and arranged with a custom designed conveying means integral thereof.

In an alternative embodiment the pipe 11 may be rotatable by a drive gear (not shown) that may be associated with a drive means (not shown) in the form of a motor adapted to be associated with the drive means. This arrangement can allow the distance between the valve means 7 and the pipes 11 to be set by the control means and thus to set the gap between the conical portion 8 of the valve means 7 and the outlet 5. This gap may be predetermined before conveying begins and may be about 20 to 25 millimetres or as required depending on the material being conveyed and the desired rate of flow of the material through the conveying means.

The valve means 7 and the hopper 2 may be made of any suitable and durable material such as, for example only, a plastics material, metal, ceramics, or any combinations thereof, and may be desirable a rotary moulded plastics material.

It will be appreciated that the control means may advantageously comprise a mechanical and/or electro-mechanical apparatus adapted, in use, to control the movement of the hopper 2 and the outlet 5 relative to the conical end portion 8 of the valve means 7, and

therefore control the gap therebetween to control the rate of discharge of the material from the hopper 2.

Wherein the foregoing description reference has been made to integers or components having known equivalents then such equivalents are herein incorporated as if individually set forth.

Although this invention has been described by way of example of possible embodiments, it is to be appreciated that improvements and/or modifications may be made thereto without departing from the scope of the present invention.

TREVOR DOUGLAS ANTHONY SCHWASS
By his attorneys
SCHUCH & COMPANY
Per:

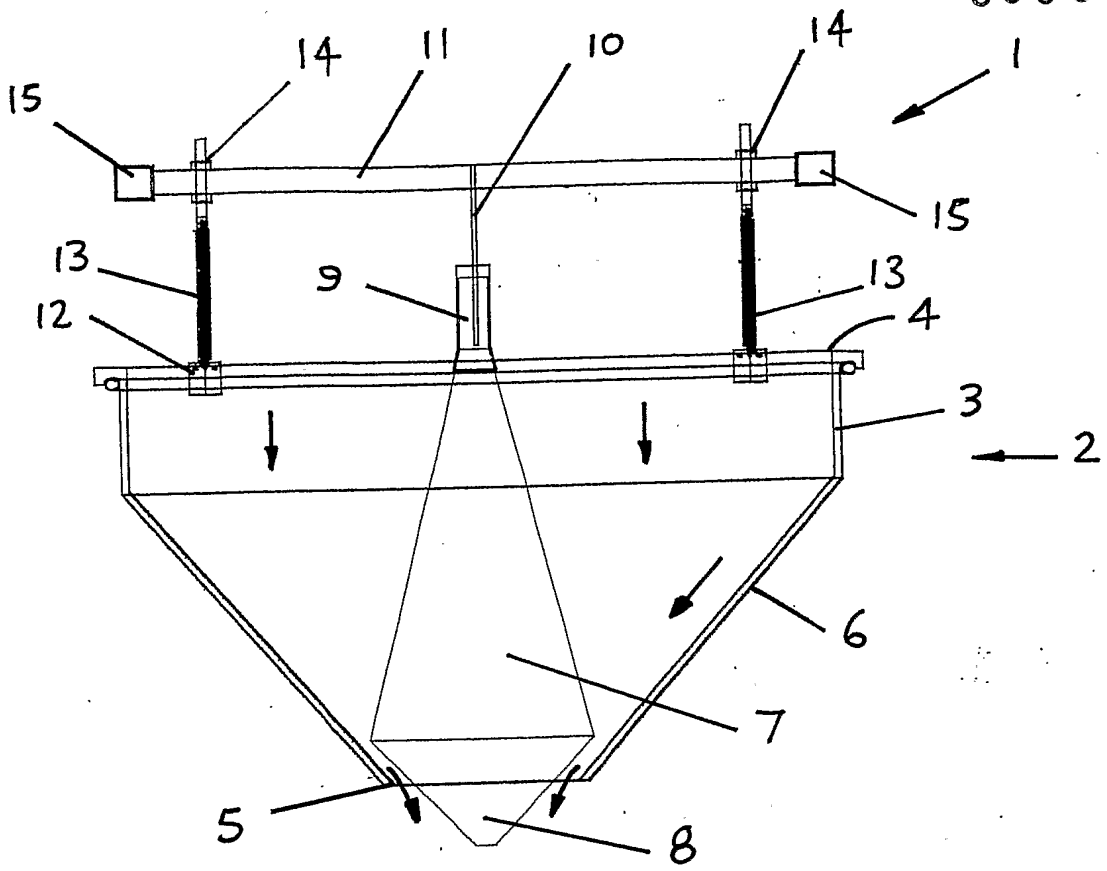

Figure 1

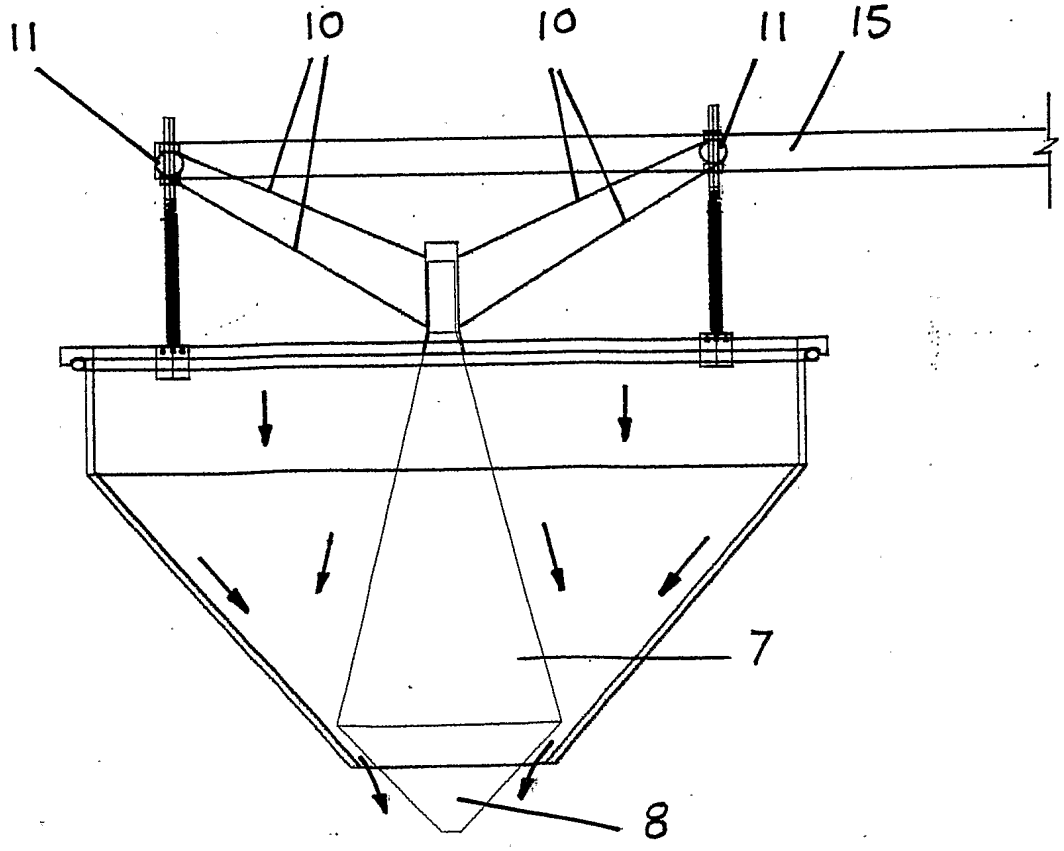

Figure 2